GRID CAUSED WILDLAND FIRES

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Concerns and Solutions

This document describes a set of concerns focused on electrical grid caused wildland fires and possible solutions to those concerns.

Grid Caused Wildland Fires

Advanced Fire Behavior Modeling

Concern: The current ignition models do not adequately reflect the real potential fire behavior characteristics. They are either based on worse case scenarios or do not include such factors as ignition fuels, ladder fuels, natural and man-made fire breaks, available resources and their suppression capabilities or actions. There are many other factors that could limit or expand a fire's potential, well beyond the simple models portrayed that use a course severity zone or risk tier approach. In addition, major fires often repeat geographically, sometimes with amazing overlap in footprint. Often a historical fire points to a repeat event once fuels regrow.

Solution: We can enhance current tiered and severity risk-based models utilizing our experiences in spatiotemporal modeling, localized weather events, topography, local and historical response capabilities and natural or manmade fuel breaks. This provides a way to more accurately understand the fire risk and loss potential as well as building a platform for other solutions such as fuel reduction and advanced infrastructure conditioning or monitoring.

All Risk Modeling

Concern: The current risk models mostly focus on infrastructure impacts such as direct loss of life, property or the environment. What appears to be a sound solution to mitigate these first level risks can actually have larger and more devastating impacts on secondary or tertiary risks, not immediately apparent. For example, shutting down power in high fire potential events could have devastating consequences by impacting individual suppression efforts (lack of water and lighting), putting citizens at risk from environmental issues such as heat exposure and impairment of communications which could cause undue stress on transportation resources. An area that is often overlooked and can have a huge impact on the risk factor of a community is non-movable pets and livestock. The lack of resources or time to move these out of harm's way often means individuals will attempt to shelter in place rather than evacuate.

Solution: We have the skills and experience to determine the potential risks associated with power interruption to include senior citizen care facilities, traffic load and patterns to accomplish egress and resource ingress. We can articulate specific methods to collaborate with stakeholders to include ambulances (patient transport) and potential receiving facilities, MCI plans, Continuity of Operation(s) Plans, Public Information and notification agencies. We can make recommendations on when and where to engage Reverse 911 and Emergency Broadcast tools to allow for more time, prior to a large disconnect. We can demonstrate where the engagement and methods of power interruption to mitigate a wildland threat may be outweighed by the unintended consequences of other risk factors. We have extensive experience in dealing with the animal side of incidents including evacuation, care and housing as well as training first responders and other organizations on the proper methods, techniques and facilities.

Electrical Start Potential Modeling

Concern: Most research in electrical fire starts are based on primary circuit faults at high voltages, with low humidity and nominal fuels. In reality the start potential is quite complex and can vary from a spark of a 120V circuit on dry grasses in a wind driven draw to a long exposure of heavier fuels on high voltage conductors.

Solution: We have analyzed a number of electrically caused fires and believe we have a more effective model in determining the true conditions for electrical starts. This method is based on years of fire ignition investigations for both electrically caused fires but other ignition types as well. We are building a model that includes not only fuel types and fuel moisture, but power/voltage, varied fuel types, localized weather events and duration of the electrical fault.

Electrical Circuit Fault Mitigation Solutions

Most of the solutions available today are primarily focused on asset protection rather than personal property or environmental protection. They are often ineffective in preventing fires or electrical hazards and are usually applied only to primary, mid voltage circuits. In addition, there is currently no solution to mitigate failures on low voltage overhead secondary circuits which have been known to cause significant wildland fires or other safety situations to both the public and first responders. The common adoption of ungrounded Delta Y circuits in California makes many common fault solutions used elsewhere inappropriate.

Solutions: The following is a list of potential solutions to solve the prevention of electrically caused hazards and or wildland fires.

Primary Stress/Strain Identification Solution

This solution identifies abnormal stress to primary circuit conductors and can simply and rapidly identify these situations so power can be terminated before conductors contact the ground or become a hazard. This solution has the additional benefit of being self-describing. I.e. the problem (sagging or broken conductor) is identified and the location is identified within ½ mile. The types of situations that this solution should be able to identify are: trees falls causing conductors to sag or break; leaning or broken poles, broken cross arms or insulators, snow and ice, landslides and earth movement. The solution is based on mechanical detection and very simple, low bandwidth and low latency communications.

Primary Stress/Strain Cutoff Solution

This solution builds upon the *Primary Stress/Strain Identification Solution* and adds the ability to disconnect the circuit locally without any form of communications or interface to Supervisory control and data acquisition (SCADA) control systems. It is an autonomous solution that is not dependent on any data communications or electrical analysis for detection or activation. In addition, the solution can provide a simple means of sectionalizing by the means of manual tripping via a hot stick for example.

Unbalanced Electrical Flow Solution

This solution provides a simple means to detect abnormal current flows and then sends a simple low bandwidth message to a remote sectionalizing system. It uses a specialized low latency, low bandwidth ad hoc network as the basis for communications and activation. It differs from Stress/Strain solutions in that it is measuring a very simple electrical flow anomaly that operates similarly in concept to a common ground fault interrupter (GFI) on a grounded circuit.

In addition, other parameters at sensing sites can be collected such as power quality metrics, ambient temperature and humidity, conductor temperature, fault currents and 3D line movements with a complementary sensor pack.

Secondary Stress/Strain Cutoff Solution

This solution is applied to secondary circuits, between transformers and premises. It can detect both over stress or under stress (free) low voltage conductor bundles.

Strategic Command

Concern: When incidents reach large scale proportions across a large physical area, resource assets can become competitive. Incident management teams (IMTs) are often at odds with each other for resources or in some cases resources are assigned where they will not do the most good. This results in inefficient utilization of critical assets and failure to achieve the most effective outcome collectively. In many cases IMT's may not have the political or technical ability to get their needs understood at the levels required to balance resources in the most effective manner.

Solution: We have deep experience in when and where strategic command is most effective, how it should be deployed, who should be involved (NGO, private, local, state and federal) and how it should be integrated into the National Response Framework. We also have significant experience in training all organizations on the methods of large-scale Incident Management and Area Command. We are currently developing a platform to manage Strategic Command events to more effectively integrate all involved organizations and stakeholders as well as provide a platform for simulation and training.

Hazard Reporting

Concern: Most organizations that used to be responsible for reporting hazards to utilities have lost this mission, i.e. meter readers are no longer deployed so there is no opportunity to inspect premise infrastructure. There are many organizations that have an opportunity to patrol areas and identify hazards, but have no easy means of communicating that information to responsible parties. With multiple organizations reporting there will be an inherent lack of uniformity in the information. In addition, during weather related incidents most organizations are overwhelmed by the sheer number of contacts and often cannot accept or process hazard reports efficiently. Also critical is that the quality of hazard reports is often poor, incomplete or not communicated appropriately.

Solution: We recommend the reintroduction of the "Army" of ground inspectors of the smaller 240v secondary conductors. This should be coupled with defensible space inspections by local and state inspectors and the general public. We have a solution to provide a simple to use mobile Hazard Reporting Solution and the necessary back end analytics and process management to effectively track and manage these reports to all involved parties, to allow for complete, uniform and high-quality hazard reporting.

Vegetation Risk Identification and Modeling

Concern: Most fuel models are built by gross vegetation types and/or by tree mortality or clearance observations. This often results in vegetation interactions that are unexpected. For example, healthy trees that fall due to poor soils or alterations in grade. Another example includes healthy specimens that are prone to self-destruction such as the California foothill pine (Pinus sabiniana).

Solution: Our experiences in fire investigation, suppression, topology and fuel modification have allowed us to have a deeper insight on the types of conditions that are prerequisites to an electrically caused fire. This knowledge and capability would be key in understanding the value of various mitigation practices such as fuel reduction, energy disruption methods or in the deployment of solutions to detect and/or prevent electrically caused incidents.

Resilience Modeling

Concern: The world is becoming less resilient to non-daily impacts. For example, the loss of power and communications today becomes critical in just a few hours or days, where decades ago people and systems could and would expect to be out of these resources periodically for much longer periods. Our world is more connected and dependent than ever before and hence it is less resilient when these capabilities are absent. (Increasingly reliable infrastructure delivery and rapid repair of interruptions have led to greater dependence and the lack of resilience. – Without regular interruption of infrastructure, the citizenry never gets to practice being self-reliant).

Solution: Based on over 150 years of collective incident management experience in thousands of fires and other incident types of all scope and scale, we can identify characteristics that demonstrate how resilient a community may be to various events. We can transfer knowledge from one community to another from a broad set of observable situations that we have seen in our careers.

Mitigation Techniques

Concern: Often the mitigation techniques and capabilities are not well established or understood, especially by smaller communities that may not have sufficient resources or capabilities.

Solution: We have the experience and history of seeing how various techniques work and don't work across the state in varied conditions. We can make very localized recommendations on what mitigation techniques will be most effective for a local area based on their specific risk factors, capabilities and the historical success of other communities with similar characteristics.

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